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A NOTE ON THE POLLINATION OF THE KANGAROO PAW *ANIGOZANTHOS MANGLESII*

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As the Kangaroo Paw, *Anigozanthos manglesii*, is the State flower as well as being the emblem of the Naturalists' Club, it is certainly curious that in all the volumes of the *Western Australian Naturalist* only a single reference is made to it (Robinson, 1947), and that one only in a quotation. Even the authors of the King's Park paper (1957) did not deem it necessary to refer to the Kangaroo Paw, probably the most famous of its flowers.

In view of this peculiar neglect, hidden under so much superficial praise, it is perhaps not surprising that the biology of the Kangaroo Paw has remained unstudied. To the best of my knowledge Sargent's (1928) record that the flowers are visited by Spinebills, *Acanthorhynchus superciliosus*, and Silvereyes, *Zosterops lateralis gouldi* (based on information supplied by Dr. D. L. Serventy), is all that has been published locally about its pollination. Sargent made the very correct observation that such a bizarre flower as the Kangaroo Paw is "unthinkable without bird-pollination," but did not further elaborate this point.

On several occasions I have observed Spinebills visiting the flowers of the Kangaroo Paw in King's Park, as doubtless practically every Western Australian ornithologist will have (cf. Serventy and Whittell, 1962: 377). On these occasions I observed the remarkable, indeed possibly unique, process of pollination.

For an understanding of what happens a short description of the flower is necessary. It can best be described as a cylinder of about 8 cm. length, closed at the basal end, and cut open longitudinally almost to its base; the distal end of the cylinder (i.e., perianth tube), is bent outwards, ending in six points. The orientation of the flower is slightly upwards or more or less horizontal, with the open part below. The six anthers are large, almost sessile on the perianth tube, attached in a row just below the place where its distal end turns upwards and outwards. The pistil is even slightly longer and entirely free from the perianth tube.

With this curious construction, what happens when a bird, usually a Spinebill, comes to obtain nectar from a flower? The bird will, of necessity, approach from below and push its bill with some force in the slit near the base of the tube. The inevitable result is that the tube, with its sides pushed apart at its base, sags in the middle, and the distal part of the flower, with the pistil and anthers, bends down to touch the bird's back. In this way, pollen will be transported from flower to flower on the back of the bird, and this, together with the way it is achieved, is the unique feature of the Kangaroo Paw referred to above.

The number of ornithophilous flowers is very large, but, as far as my own observations go, all other flowers are what might

be called head-pollinators, in that the pollen becomes attached to the head, usually the forehead, of the visiting bird.

Though on the basis of some simple observations it would not appear justified to speculate too much, an obvious advantage of back-pollination would be that the pollen would not be rubbed off so easily. A nectar-sucking bird might visit several different species of flowers, and each time some of the pollen on its forehead would be rubbed off and replaced by pollen of the new flower, in that way doubtless decreasing its efficiency as a pollinator for each of those species of flowers. The back of the bird, however, remains exclusively reserved for the Kangaroo Paw; there are no other kinds of pollen to compete with, and the pollen might remain in place for several days.

There would be one disadvantage to back-pollination: a bird, or for that matter an insect or any other pollinator, would always insert its head into a flower when going to extract nectar from it, and therefore only a very small part, but every time the same part, of the body would come into contact with anthers and pistils. The back of a bird has, however, a much larger area, and moreover the bird would certainly not bother about how and where exactly it was touched by the plant. The chance that during successive visits to flowers exactly the same part of the back would make contact every time would be slight. It appears to me that the plant overcomes this difficulty by the size of its anthers. The six large anthers, placed close together, have a surface of about one square centimetre. With an area of this size being covered with pollen every time a flower is visited, the chances of successful fertilization should be quite good.

Above, I quoted Sargent's remark that the Kangaroo Paw would be unthinkable without bird-pollination. From the mechanism of pollination as described above it will be evident why. In these flowers, nectar and pollen are some 7 cm. apart. There-

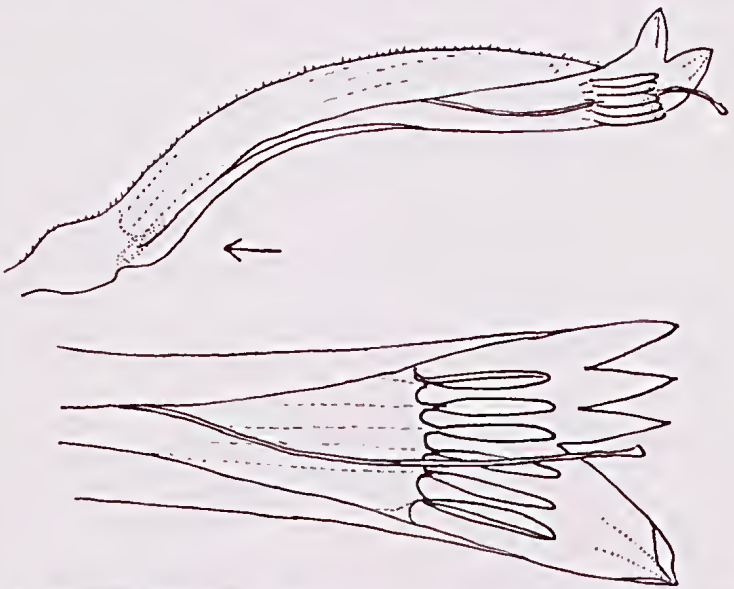

Fig. 1—Upper: Flower of Kangaroo Paw, natural size; the arrow indicates the point where the bird's bill is inserted. Lower: Apical part of the perianth tube, showing position of anthers, twice natural size.

fore, even if an insect were strong enough to push open the perianth tube when reaching for the nectar, which I doubt, stamens and pistils could never come in contact with its body. To insects which might be interested in eating or collecting pollen, access is made about as difficult as possible: on the under-surface of the long and very flexible tube. Moreover, though the outside of the perianth is rough and hairy, its inside is remarkably smooth, presumably making a foothold for insects even more precarious.

Though I know of no other indigenous flower which uses back-pollination, it is quite likely that it occurs elsewhere. In this connection *Hibiscus* comes to mind, where there is also a great distance between nectar and pistils, but the structure is entirely different. Unfortunately in Western Australia I have never seen birds play any role in pollination of *Hibiscus*. Admittedly the flowers are frequently visited by honeyeaters, notably the Brown Honeyeater, *Lichmera indistincta*, but they appear invariably to reach for the nectar from outside, pushing their bills between calyx and corolla.

The few simple observations on the Kangaroo Paw recorded here have, of course, not nearly cleared up all the problems surrounding the pollination of this remarkable plant. For example, the Spinebill is doubtless its most important pollinator, but Silvereyes have been recorded, and there may well be others. It would be interesting to study the relative importance of other pollinators. How do the ranges of *Anigozanthos manglesii* and *Acanthorhynchus superciliosus*, both endemics of South-Western Australia, compare; and, if the former occurs anywhere outside the range of the latter, which bird takes its place as chief pollinator? Is there a difference in time of ripening between stamens and pistils in the Kangaroo Paw, or some other device to prevent self-pollination, and how successful actually is the plant at producing seed and at dispersal by seed?

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MIST-NETTING AND RINGING THE NOISY SCRUB-BIRD

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Early in 1964 arrangements were finalised by Mr. Graham Pizzey, of Melbourne, with the Australian Broadcasting Commission and the Fisheries & Fauna Department of Western Australia, to mist-net the Noisy Scrub-bird *(Atrichornis clamosus)* for a nature documentary film to be released for the national television network. Accordingly, on January 5, 1964, a party of naturalists travelled to Albany to conduct the operation. These included Messrs. H. B. Shugg (Fauna Officer of the Fisheries & Fauna Department), R. H. Stranger, V. N. Serventy and myself. At Two People Bay, east of Albany, we joined Mr. Pizzey, who with Mr. H. O. Webster, had cleared a narrow lane in one of the Scrub-bird territories in a thicket on the slopes of Mt. Gardner.